


“MIL-PRF-680 and WEAPONS CLEANING”


A white globe with black outlines of continents, centered behind the word "and" in the title. The globe is tilted slightly and has a soft shadow beneath it. The background is a gradient from light gray at the top to dark gray at the bottom.

INLAND TECHNOLOGY

Pollution Prevention By Design

INLAND TECHNOLOGY

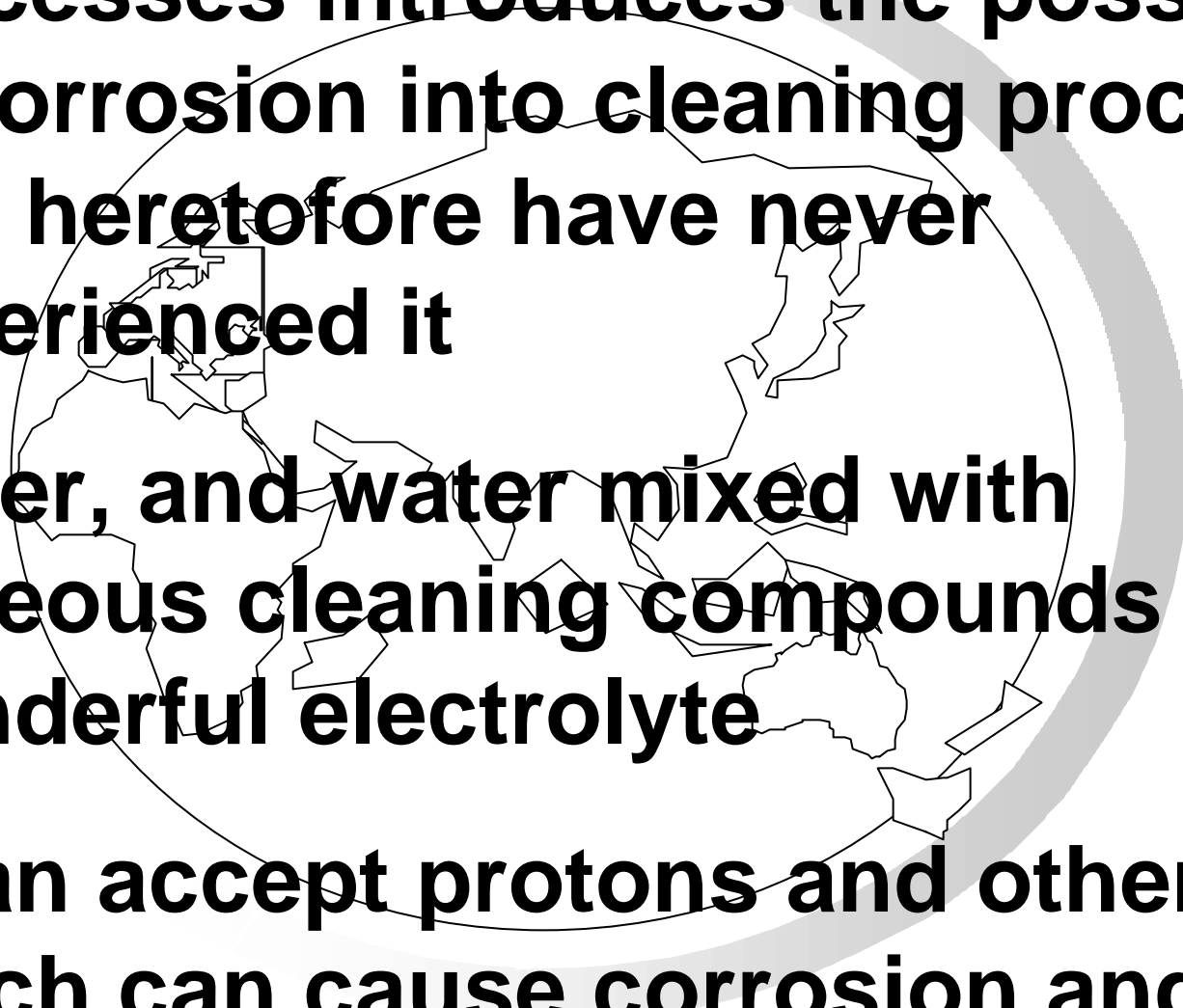
AGENDA

- **CLEANING METHODS**
 - **AQUEOUS**
 - **ENZYMES**
 - **SOLVENTS**
- 

INLAND TECHNOLOGY

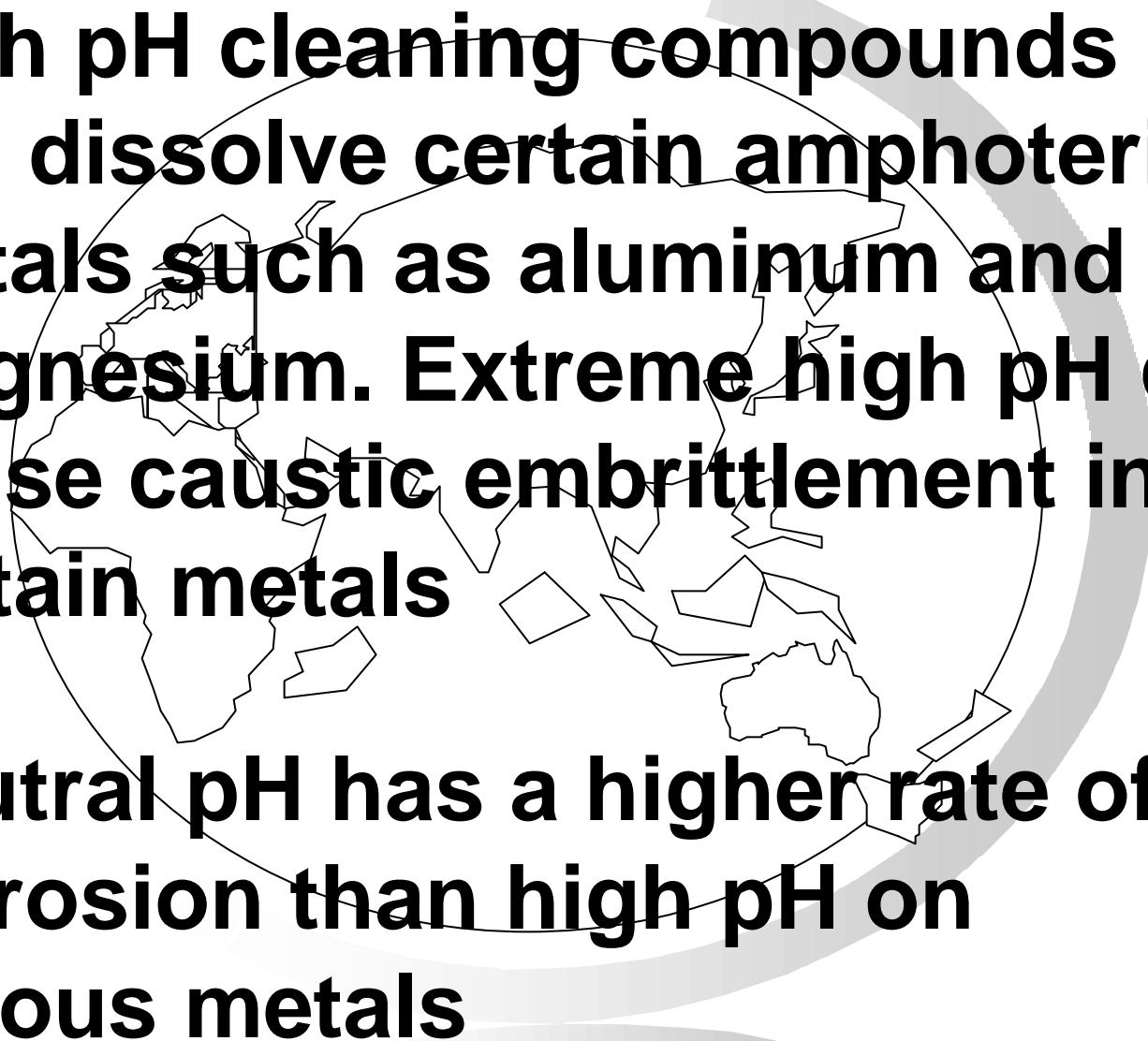
AQUEOUS CLEANING

- **Aqueous cleaning always causes some corrosion. It is only a matter of the rate at which it occurs**
- **Often, it is of no consequence -- sometimes it is critical**

- 
- **The use of water in cleaning processes introduces the possibility of corrosion into cleaning processes that heretofore have never experienced it**
 - **Water, and water mixed with aqueous cleaning compounds is a wonderful electrolyte**
 - **It can accept protons and other ions which can cause corrosion and hydrogen embrittlement**

Aqueous Cleaning Things You Need To Worry About

- **Low pH can cause hydrogen embrittlement and other corrosion effects. Water contains large numbers of free protons which can cause hydrogen embrittlement in high strength steels. The lower the pH, the greater the problem.**

- 
- **High pH cleaning compounds can dissolve certain amphoteric metals such as aluminum and magnesium. Extreme high pH can cause caustic embrittlement in certain metals**
 - **Neutral pH has a higher rate of corrosion than high pH on ferrous metals**

INLAND TECHNOLOGY

AQUEOUS CLEANING

Contaminants in the water used:

- **Minerals, metal ions, chlorides**
- **Chlorine & dissolved oxygen content**
 - **Shop water**
 - **Factory water**
 - **Laboratory water**

INLAND TECHNOLOGY

AQUEOUS CLEANING

Cleaning Process & Dwell Time

- **Tank cleaning**
- **High pressure spray**
- **Low pressure spray**
- **Spray and wipe**

INLAND TECHNOLOGY

AQUEOUS CLEANING

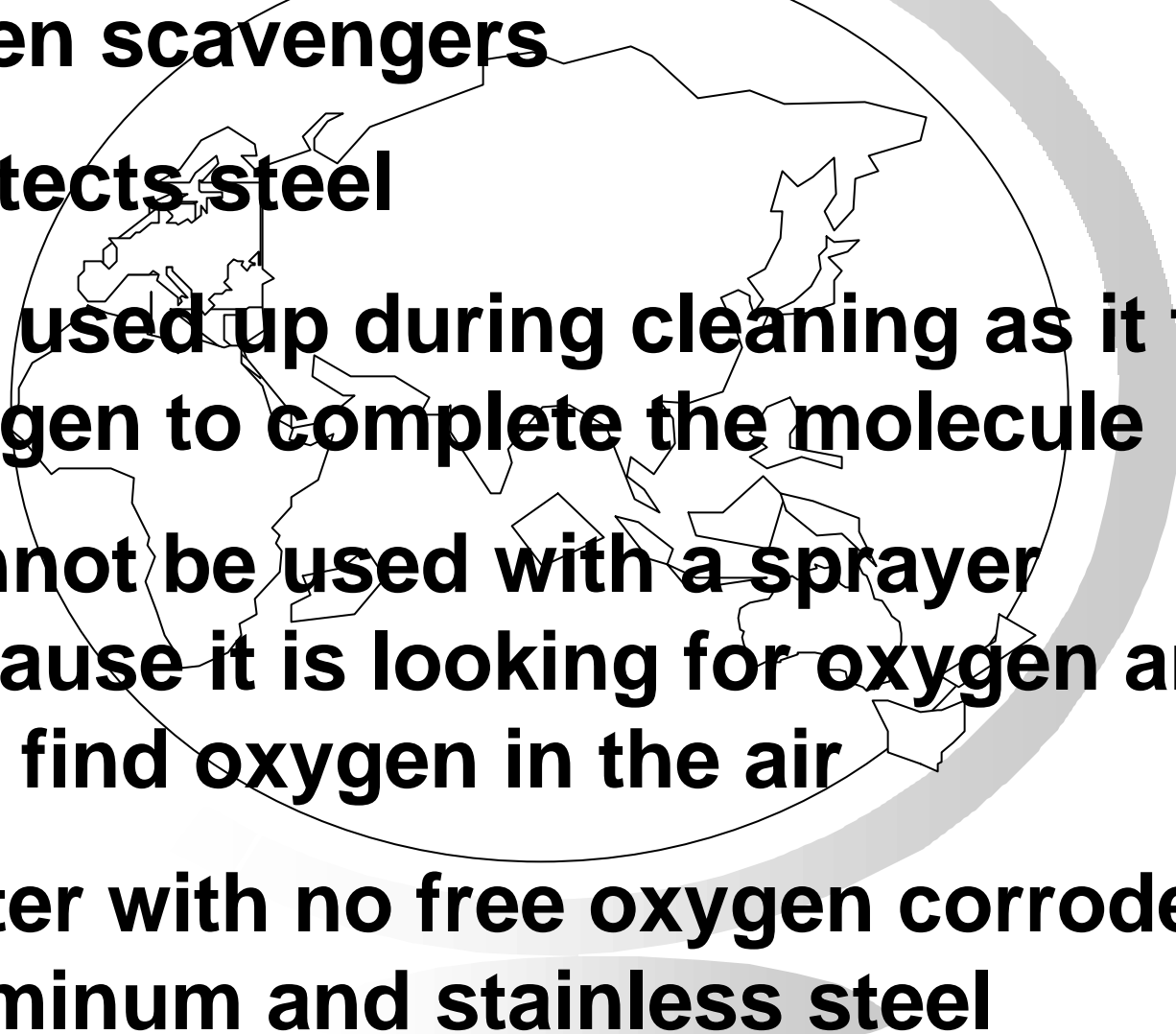
Cleaning Temperatures

- **Certain chemicals that are benign or protective at low temperature can be corrosive at high temperature**
- **The corrosion process accelerates at higher temperatures**

Rinsing & Drying

- **Is the rinsing process thorough enough to get all the cleaning compound off of the part?**
- **Was the part dried totally?**
- **Was the part dried in a decent amount of time?**
- **Did the part have overlapping surfaces and/or fine holes where salts and cleaning compounds are left behind?**

Corrosion Inhibitors

- **Oxygen scavengers**
 - **Protects steel**
 - **Get used up during cleaning as it finds oxygen to complete the molecule**
 - **Cannot be used with a sprayer because it is looking for oxygen and can find oxygen in the air**
 - **Water with no free oxygen corrodes aluminum and stainless steel**
- 

Corrosion Inhibitors



- **Protective Filming Agents**
 - **Each chemical effective only for specific metals**
 - **Some can be harmful when used on the wrong metal**

INLAND TECHNOLOGY

AQUEOUS CLEANING

AIR FORCE MESSAGE:

SUBJECT: LANDING GEAR SAFETY

CONCERN; AQUEOUS CLEANERS

DTD: 252108Z JAN 00

INLAND TECHNOLOGY

AQUEOUS CLEANING

“1. EFFECTIVE IMMEDIATELY, DISCONTINUE USE OF ‘DARACLEAN 282GF’ FOR CLEANING OF ANY LANDING GEAR COMPONENT. THIS MATERIAL HAS A HIGH PH AND HAS BEEN FOUND TO BECOME MORE AGGRESSIVE AT ELEVATED TEMPERATURES IN PART WASHER CABINETS...”

www.afcpo.com

INLAND TECHNOLOGY

ENZYME CLEANING

- **Manual cleaning system featuring a water-detergent combination that is laden with oil-eating bacteria, or bugs.**
 - **The water-detergent-bug mixture is kept in a heated tank below the sink.**
 - **Theoretically, the spent tank water, when changed, can be poured down a drain.**
-
-

INLAND TECHNOLOGY

ENZYME CLEANING

- **“As with other APW’s, this theory ignores the presence of heavy metals from the washed parts that may accumulate in the tank, rendering the water hazardous.”**

**Aqueous Parts Washer Survey
Air Force Corrosion Control Office
10 Dec 1999**

INLAND TECHNOLOGY

ENZYME CLEANING

- **“A final thought is that if the enzyme cleaner supports the life of oil-eating bacteria, it may also support other harmful bacteria and technicians using the system without gloves may transmit infections to one another”**

**Aqueous Parts Washer Survey
Air Force Corrosion Control Office
10 Dec 1999**

INLAND TECHNOLOGY

ENZYME CLEANING

ARMY ENVIRONMENTAL CENTER

**Armed Services Test Protocol for
Alternative Cleaner Performance
Validation**

MAY 99 - FEB 00

INLAND TECHNOLOGY

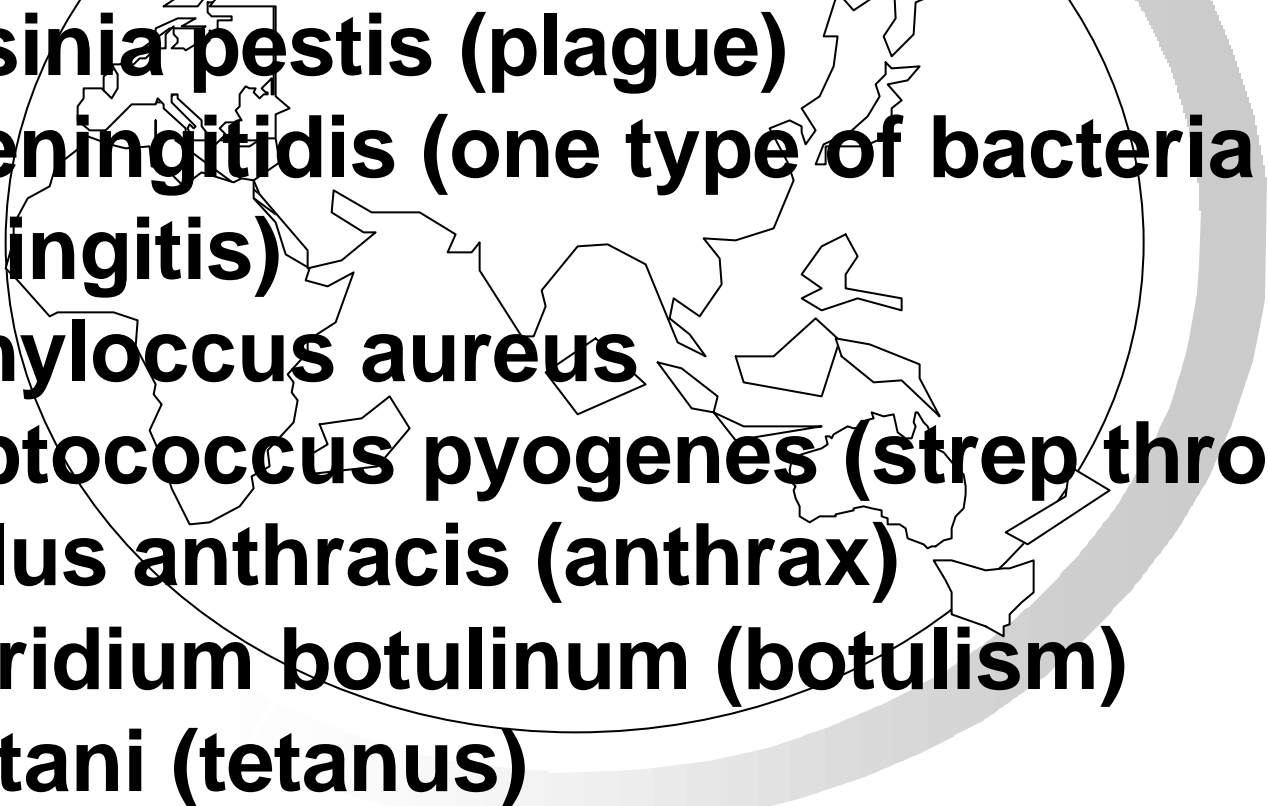
ENZYME CLEANING

“THE FOLLOWING IS A LIST OF MICROBES THAT COULD POTENTIALLY PROPAGATE IN AN ENZYME-BASED CLEANING SOLUTION:

- a. Bordetella pertussis (whooping cough)**
 - b. Francisella tularensis (tularemia)**
 - c. Pseudomonas aeruginosa (wound infection)**
 - d. E.coli.**
 - e. Salmonella typhi (typhoid fever)**
 - f. Vibrio cholerae (cholera, Asiatic)**
-

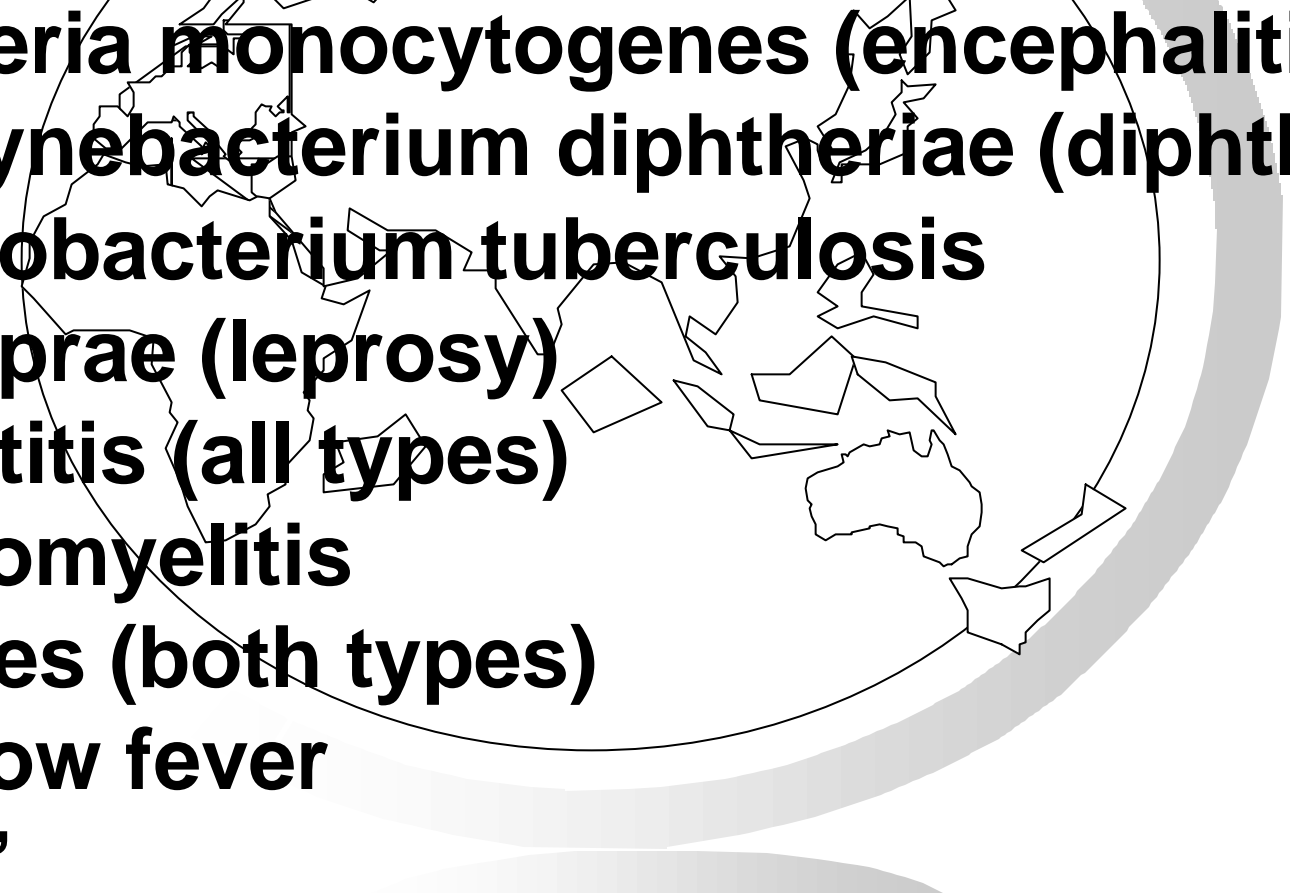
INLAND TECHNOLOGY

ENZYME CLEANING

- 
- g. Yersinia pestis (plague)**
 - h. N.meningitidis (one type of bacteria meningitis)**
 - l. Staphylococcus aureus**
 - j. Streptococcus pyogenes (strep throat...)**
 - k. Bacillus anthracis (anthrax)**
 - l. Clostridium botulinum (botulism)**
 - m. C.tetani (tetanus)**
-
-

INLAND TECHNOLOGY

ENZYME CLEANING

- 
- n. *Listeria monocytogenes* (encephalitis)**
 - o. *Corynebacterium diphtheriae* (diphtheria)**
 - p. *Mycobacterium tuberculosis***
 - q. *M. leprae* (leprosy)**
 - r. Hepatitis (all types)**
 - s. Poliomyelitis**
 - t. Rabies (both types)**
 - u. Yellow fever**
 - v. HIV”**
-
-

INLAND TECHNOLOGY

ENZYME CLEANING



INLAND TECHNOLOGY

SOLVENT CLEANING



**What
is
PD-680?**

INLAND TECHNOLOGY

SOLVENT CLEANING

PD-680 CANCELED

13 DEC 1999



INLAND TECHNOLOGY

SOLVENT CLEANING

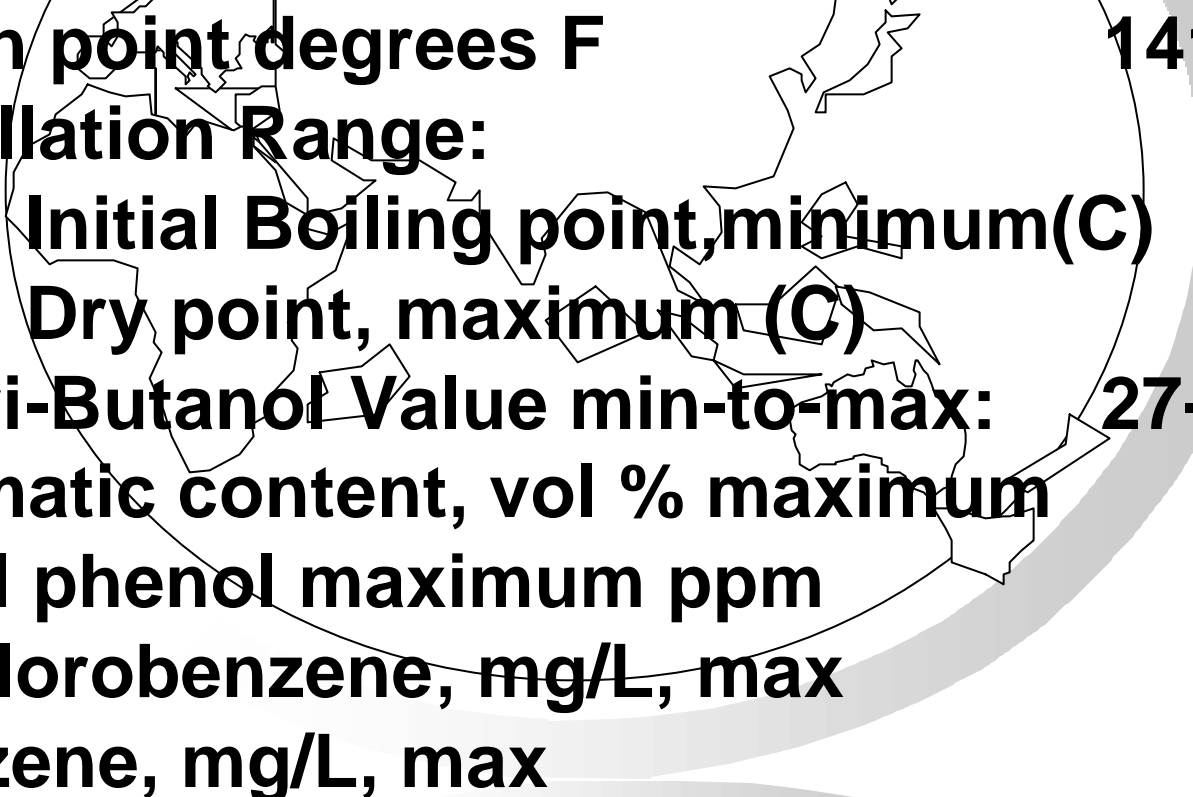
MIL-PRF-680



INLAND TECHNOLOGY

SOLVENT CLEANING

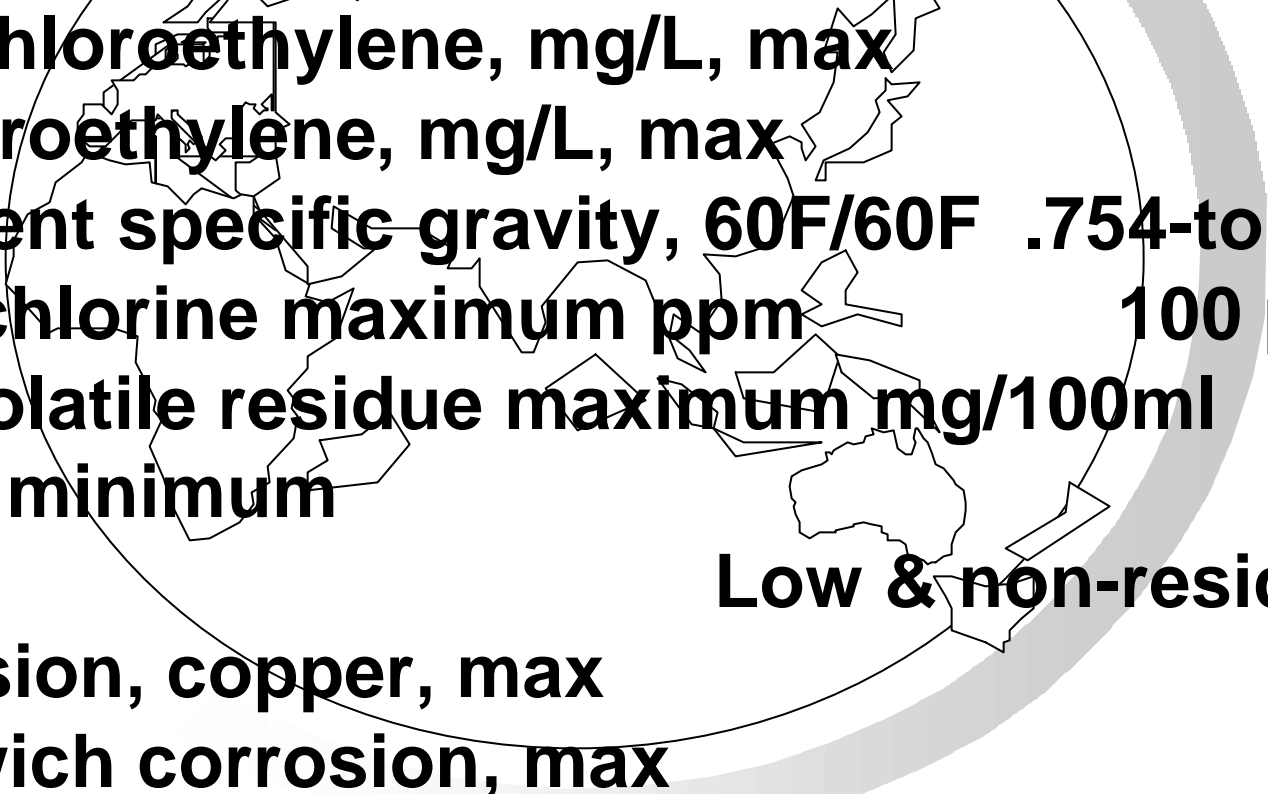
TEST CHARACTERISTICS FOR MIL-PRF-680



Flash point degrees F	141-198
Distillation Range:	
Initial Boiling point, minimum (C)	177
Dry point, maximum (C)	212
Kauri-Butanol Value min-to-max:	27-to-45
Aromatic content, vol % maximum	1
Total phenol maximum ppm	0.5
Dichlorobenzene, mg/L, max	0.5
Benzene, mg/L, max	0.5

INLAND TECHNOLOGY

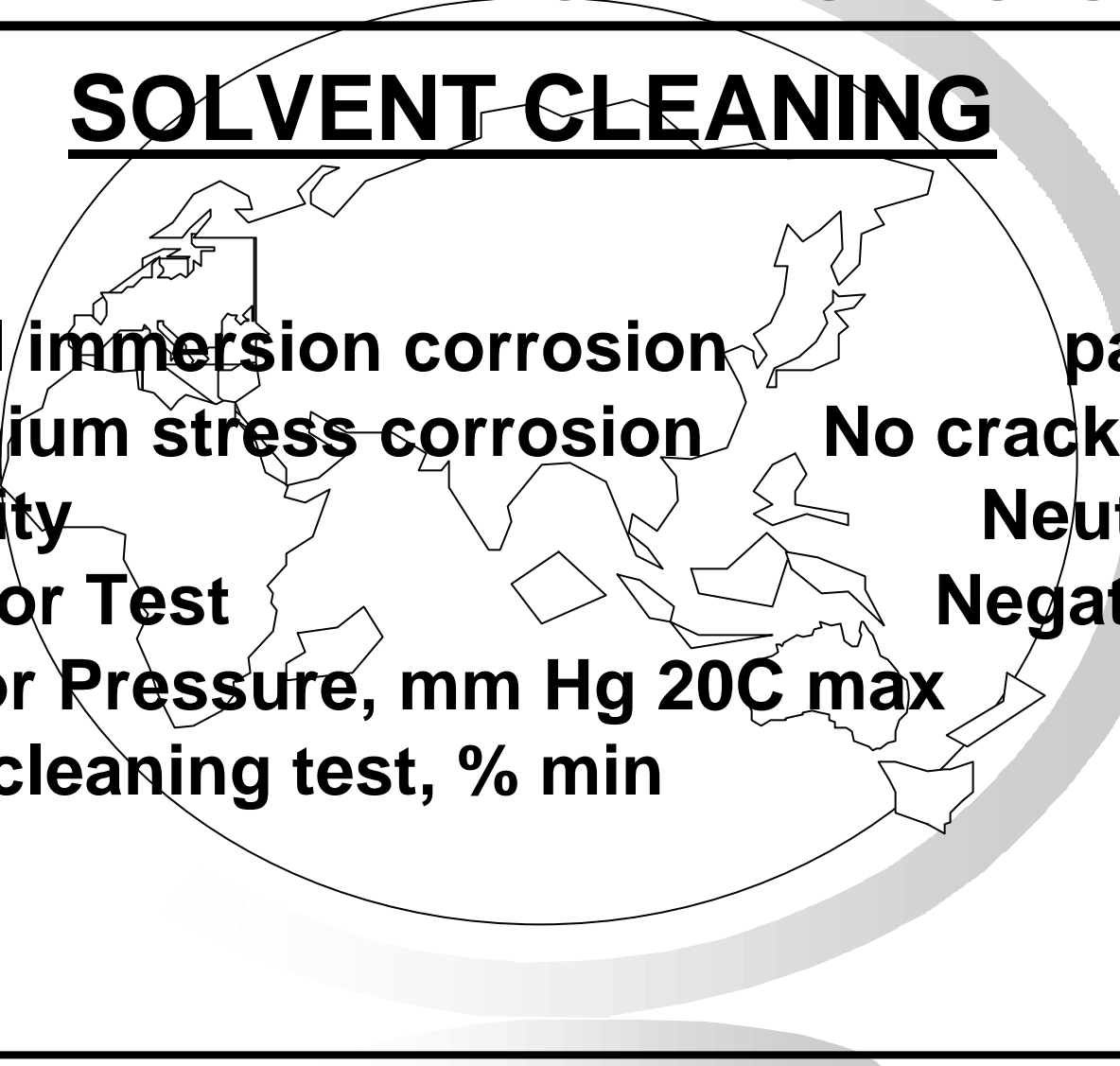
SOLVENT CLEANING



Tetrachloroethylene, mg/L, max	0.5
Trichloroethylene, mg/L, max	0.5
Apparent specific gravity, 60F/60F	.754-to.820
Total chlorine maximum ppm	100 ppm
Non-volatile residue maximum mg/100ml	8
Color, minimum	25
Odor	Low & non-residual
Corrosion, copper, max	1 lb
Sandwich corrosion, max	1

INLAND TECHNOLOGY

SOLVENT CLEANING



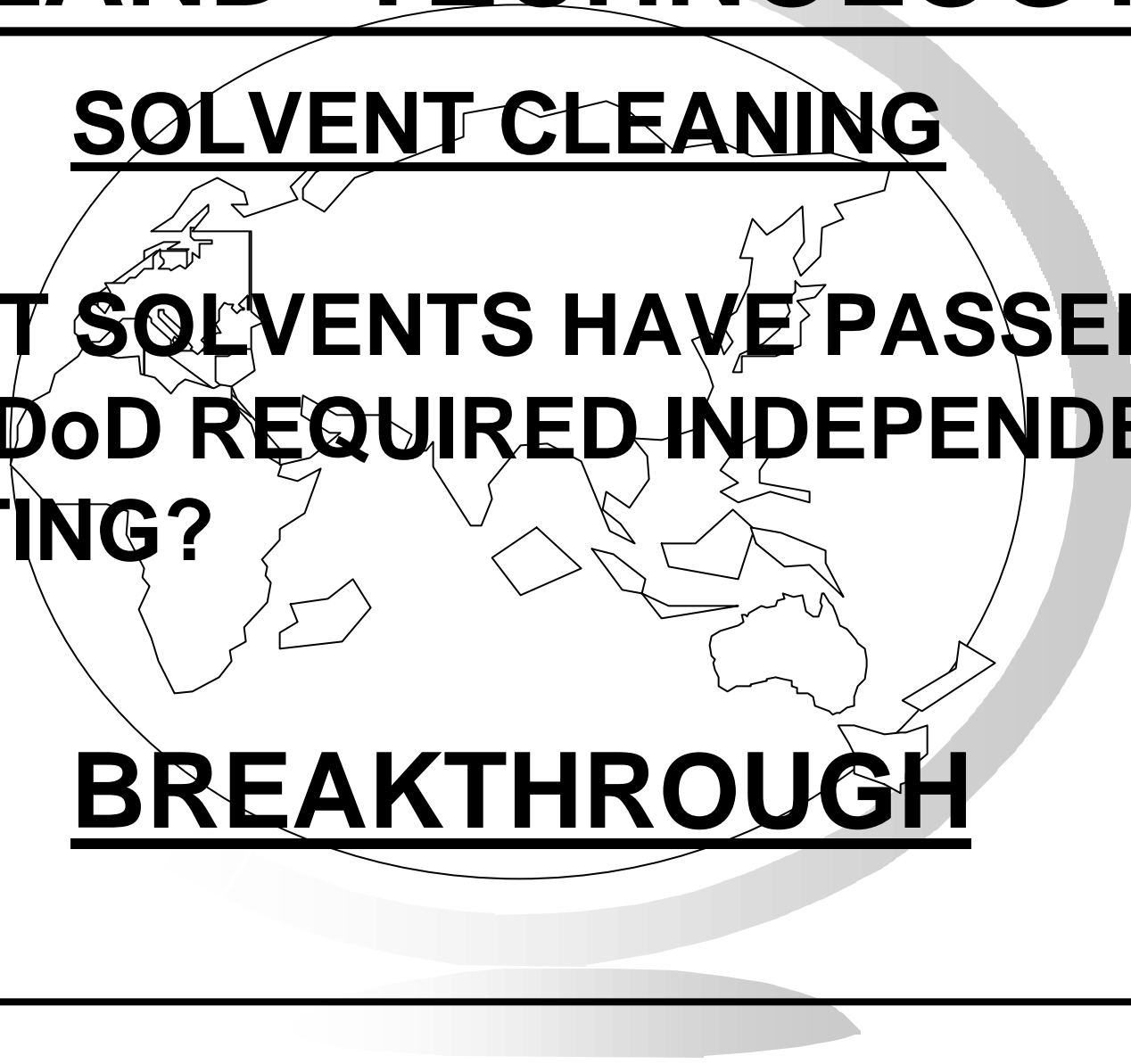
Total immersion corrosion	pass
Titanium stress corrosion	No cracking
Acidity	Neutral
Doctor Test	Negative
Vapor Pressure, mm Hg 20C max	2.0
Soil cleaning test, % min	85

INLAND TECHNOLOGY

SOLVENT CLEANING

**WHAT SOLVENTS HAVE PASSED
THE DoD REQUIRED INDEPENDENT
TESTING?**

BREAKTHROUGH



INLAND TECHNOLOGY

SOLVENT CLEANING

PROOF??

- **DoD LTR dtd 12 Jun 2000**
- **AF MSG dtd 121433Z Apr 00**

INLAND TECHNOLOGY

SOLVENT CLEANING

Small Arms ...

ADVICE FOR ARMORERS



Cleaning

If your CO tells you a weapon must be cleaned three times before it's clean enough for storage and inspection, tell him respectfully "No, sir, not if we do it right the first time."

Once is enough if a weapon's cleaned like the -10 TM says.

Once a weapon's cleaned right, it doesn't need to be cleaned again for 90 days, unless it leaves the arms room or shows signs of corrosion.



PS 564

Solvents

It's OK to use dry cleaning solvent to clean your rifles, machine guns, and pistols. There are some sealed assemblies, however, like the MK19's seal housing, that shouldn't be dunked in solvent. Solvent breaks down the lubricant inside the sealed assemblies. See your -10 TM for cautions on solvent.



But once you've finished cleaning with solvent, wipe the solvent completely off and lube the weapons.

36

NOV 99

Solvent completely removes lubricant, so if weapons are stored without lube, corrosion is on the way.

Shiny Spots

Shiny spots on your weapons mean their finish has worn off and they're helpless against corrosion. You can protect against shiny spots with solid film lubricant, NSN 9150-00-754-0064.



Storage

Barrel caps are for the field, not the arms room. They trap condensation inside the barrel, which leads to corrosion.

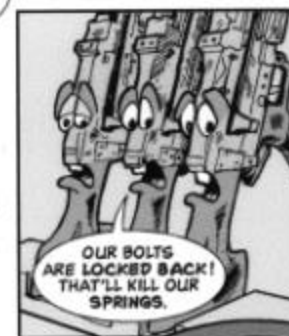


PS 564

37

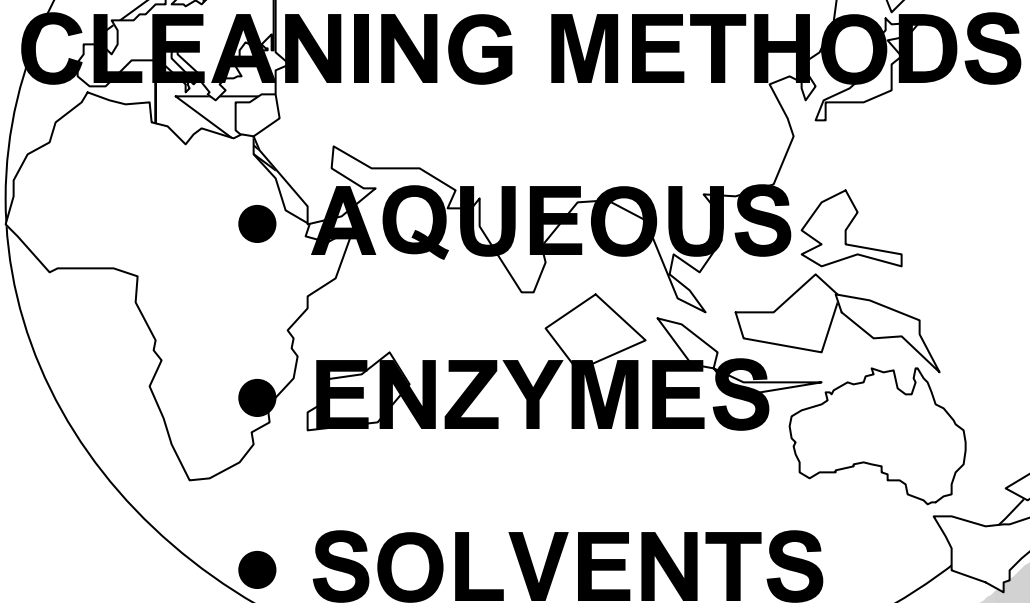
If you have trouble with humidity in the arms room, get a dehumidifier, NSN 4440-00-566-0616. It will suck up most of that moisture. Use Chap 63 of CTA 50-909 as your ordering authority.

Last but not least, store all your weapons with the bolts forward. If you store them cocked, their springs are left compressed. Soon the springs have little spring and you've got problems like poor recoil and feeding.



INLAND TECHNOLOGY

SUMMARY

- 
- **CLEANING METHODS**
 - **AQUEOUS**
 - **ENZYMES**
 - **SOLVENTS**

INLAND TECHNOLOGY

WAYNE AGNESS

(253) 383-1177

1-800-552-3100

wagness@inlandtech.com